Abstract submitted for the Thirteenth (13th) Annual Argonne Symposium for Undergraduates in Science, Engineering and Mathematics; October 25-26, 2002; Argonne National Laboratory; Argonne, IL.

CONDENSED MATTER PHYSICS

$Lu_2V_2O_{(7-x)}$: A NEW SYSTEM OF OXYGEN-DEFICIENT COMPOUNDS**

Greg T. Knoke†, Julienne M. Hill, David C. Johnston (Ames Laboratory and Department of Physics and Astronomy, Iowa State University, Ames, Iowa 50011)*

The pyrochlore structure compound $Lu_2V_2O_7$ orders ferromagnetically with a Curie temperature T_c = 73 K, and is a member of the small class of ferromagnetic semiconductors. We have been interested in synthesizing metallic oxide compounds with novel properties by creating a non-integral oxidation state of the constituent transition metal ions. One such example is the system LiV_2O_4, a metallic compound that is geometrically frustrated for antiferromagnetic ordering and which exhibits heavy fermion behavior at low temperatures. Our goal was to synthesize an analogous metallic system by establishing a non-integral oxidation state for the vanadium ions in $Lu_2V_2O_7$. Our initial attempts focused on replacing one oxygen in the formula unit with fluorine to create $Lu_2V_2O_6F$, which was found not to crystallize in the pyrochlore structure. We then discovered that new oxygen-deficient $Lu_2V_2O_{7-x}$ compounds with $0 \leq x \leq 0.7$ could be formed by hydrogen reduction of $Lu_2V_2O_7$ at relatively low (550–750°C) temperatures. Powder x-ray diffraction analysis showed these compounds to have lattice parameters almost identical to the parent compound with some variation in peak intensities which was inconsistent with preferred orientation effects. Magnetic measurements indicated that the Curie temperature is strongly suppressed by oxygen deficiency, e.g. from T_c = 73.5 K for x = 0 to $T_c \cong$ 30–45 K for x = 0.53. Further studies of the homogeneity range and magnetic behaviors are in progress.

**This work was supported by the US DOE under contract No. W-7405-Eng-82.
† gknoke@iastate.edu